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History of the Eastern Rockies Forest Conservation Board 1947-1973. 2
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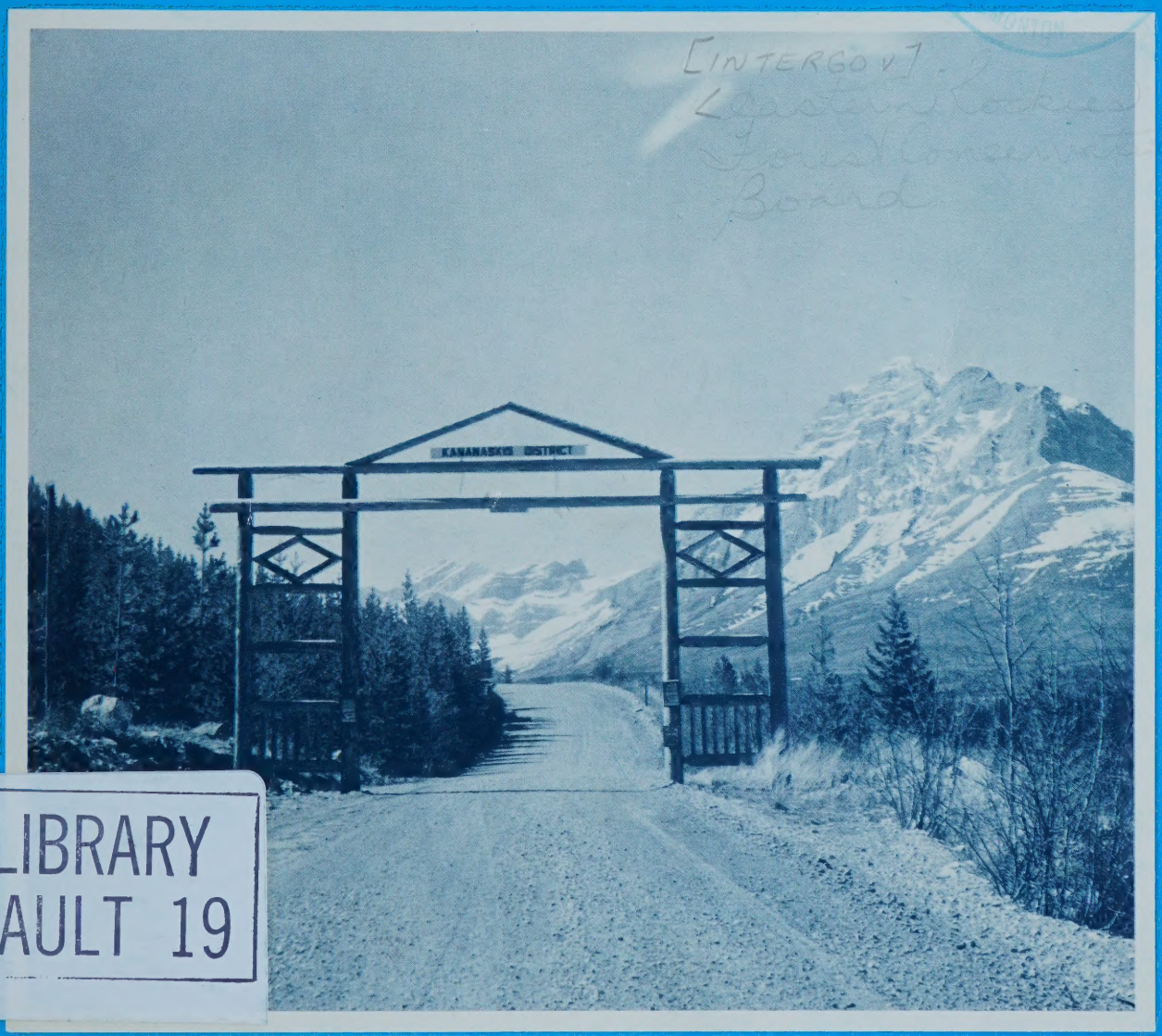
# HISTORY OF THE EASTERN ROCKIES FOREST CONSERVATION BOARD 1947—1973

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Eastern Rockies Forest Conservation Board

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A REPORT BY W. R. HANSON, CHIEF FORESTER IN COLLABORATION WITH MEMBERS OF THE EASTERN ROCKIES FOREST CONSERVATION BOARD.

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# 1. INTRODUCTION

1. The eastern slopes of the Canadian Rocky Mountains are of crucial national economic importance because they are the source of most of the water that flows through the Saskatchewan River System. Thus they provide water not only to the major part of the Province of Alberta in which they lie but also to the two provinces to the eastward.

The coniferous forests of these slopes play a vital role in controlling water movement. However, inadequate fire protection and uncontrolled exploitation of the natural resources posed a serious threat to this watershed. The governments of Canada and Alberta were keenly aware of the desirability of maintaining a satisfactory ecological balance despite the growing pressure for accelerated economic and recreational development. Their concern, first expressed in 1937, culminated in 1947 after discussions interrupted by the war, with the formation of the Eastern Rockies Forest Conservation Board.

The acts passed by Parliament and the Alberta Legislature establishing the Board, and the excellent cooperation between the two governments, gave the Board a high degree of autonomy in planning and executing the various policies and programs required to discharge their basic responsibility of protecting and preserving the watershed.

To do this, knowledge and skills not readily available, nor normally possessed by governments, had to be acquired. The results of the Board's twenty-five year stewardship indicate a considerable degree of success was achieved in gaining and applying expertise. Coincidentally, the Alberta Forest Service also gained experience and knowledge in the problems peculiar to the Eastern Rockies area and gradually, with the Board's cooperation, assumed much of the responsibility

originally carried by the Board. As the two governments are of the opinion that the Alberta Forest Service now has the capability for successful administration of the East Slopes the agreement is not being renewed, and therefore, as of March 31, 1973, the Eastern Rockies Forest Conservation Board was dissolved.

This history is written in the belief that the record of the Board's very considerable contribution to water conservation, through intelligent use of all the resources of the watershed, should be preserved.

## 3. DESCRIPTION OF THE CONSERVATION AREA

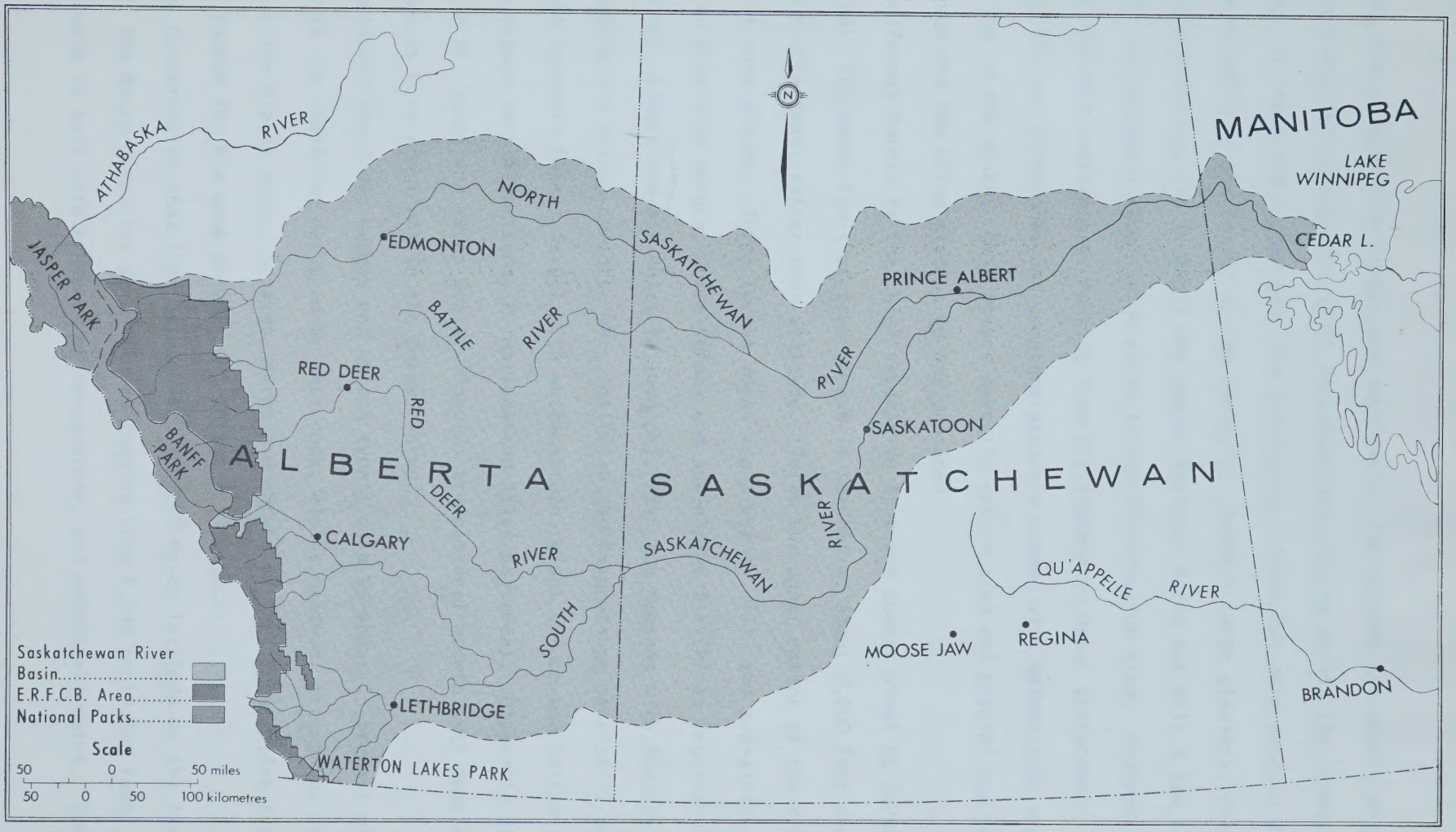
The Eastern Rockies Forest Conservation Area covered about 9,000 square miles of mountains and foothills on the eastern slopes of the Rocky Mountains in Alberta, comprising a tract of public land held in the name of the Province of Alberta and known also as the Rocky Mountains Forest Reserve.

The Saskatchewan River rises in the area and flows eastward and northeastward into Lake Winnipeg. It drains an area of 130,000 square miles and contains about 40 percent of the grain-growing area of the Prairies and a somewhat higher proportion of the livestock ranching area. More than 2,000,000 acres of irrigated land draw their water from this river. The large population centres of Calgary, Edmonton, Saskatoon and Prince Albert and many other communities are watered by it. About 85 percent and 42 percent respectively, of the populations of the provinces of Alberta and Saskatchewan live within this basin.

The Area* is mostly mountains with only the eastern fringe lying in the foothills. Peaks along the Continental Divide range from 8,000 to 10,000 feet above sea level and the eastern boundary lies near the 4,500 foot contour in the south and the 4,000 foot contour farther north. The mountain ranges, with valleys

*Area - refers to Eastern Rockies Forest Conservation Area or the Rocky Mountains Forest Reserve.

# SASKATCHEWAN RIVER BASIN



between, run generally northwest and southeast. The streams are mostly antecedent, flowing along the valleys for short distances and cutting across the ranges. Topography is steep and rugged near the Continental Divide but more subdued with strong evidence of glaciation to the eastward. Several large glaciers, which are presently receding, lie in Banff and Jasper National Parks but only a few minor glaciers or permanent snow fields exist in the Conservation Area. Bedrock is almost entirely sedimentary, ranging from Pleistocene to Upper Cretaceous. Sandstones, shales, limestones and conglomerates are common with metamorphic argilites appearing in the south. Coal occurs over the entire area and natural gas and petroleum are now being discovered and produced.

Coniferous forest is the chief vegetative type and covers about 65 percent of the area. The upper limit of tree growth is reached at about 7,000 feet elevation, although rockiness, rather than altitude, limits the upper extent of the tree cover in many places. Three forest zones are present: (1) the sub-alpine dominated by Engelmann spruce, white spruce and sub-alpine fir (Picea Engelmannii, P. glauca var. Albertiana and Abies lasiocarpa), (2) the Montane with lodgepole pine and Douglas fir (Pinus contorta var. latifolia and Pseudotsuga menziesii) and (3) the northern Boreal forest with white spruce, black spruce and balsam fir (Picea glauca var. Albertiana, P. mariana and Abies balsamea). Lodgepole pine is found in all zones and aspen poplar (Populus tremuloides) occurs over most of the area but is more prominent in the Boreal forest.

Grassland (meadows, swamps and upland types) make up about 15 percent of the area with the remainder occupied by bare rock, alpine meadows, or scrubby tree cover in the alpine zone. Grasses, herbs and shrubs of these vegetative types supply forage for big game animals and domestic livestock.

The Conservation Area lies between $50^{o}$ and $54^{o}$ north latitude on the leeward side of the Rocky Mountains at altitudes ranging from 4,000 to 10,000 feet. Thus the climate is cool with extremes of temperature, and moderately moist. Summer

maximum temperatures reach 80° F. plus, and winter minimums are around -40° F. Strong southwesterly winds are common. Precipitation in the lower foothills is about 20 inches annually but the precipitation increases rapidly with a rise in elevation, reaching an estimated 50 to 60 inches along the Continental Divide. Much of the precipitation falls as snow. Along the outer foothills a little less than half falls between October and May, but in the higher mountains about 65 percent falls as snow in this same period.

Temperatures, and resultant evapo-transpiration rates, decrease upslope while precipitation increases. Consequently, the water yield rises with elevation and ranges from about 10 acre inches rainfall equivalent in the outer foothills to over 30 inches on the alpine watersheds.

The Area offers both renewable and non-renewable resources: wood, water, wildlife, grazing, recreation, minerals and petroleum products.

## 4. HISTORY OF THE AREA

Economic use of the Area began with the arrival of settlers and the railroad in the late 1800's. The Province of Alberta was formed from part of the Northwest Territories and became a province in 1905, but some of the east slopes of the Rockies had been utilized before that. The first railroad went through the mountains in 1885 and timber from the forests provided railway ties. Coal was mined in the Crowsnest Pass at the turn of the century. Ranches were established along the foothills as early as the 1870's and there was some grazing of cattle in the mountain valleys.

Rapid settlement, commencing about 1900, led to the reservation of certain areas along the Rocky Mountains for national parks and forest reserves. In 1910, legislation established the Rocky Mountains Forest Reserve which later became the Eastern Rockies Forest Conservation Area.

It is a federal principle in Canada that the provinces own and control the

natural resources within their borders but, when the prairie provinces were formed from the Northwest Territories, the natural resources were not immediately turned over to them. Control of resources was retained by the Federal Government as a temporary measure until 1930.

The Rocky Mountains Forest Reserve in Alberta was administered and managed by the Dominion Forestry Service, a division of what was then the Department of the Interior. The Reserve was subdivided into three forests, each containing several ranger districts. Boundaries were surveyed, trails and telephone lines were constructed connecting each Forest Headquarters with Ranger Stations, lookout towers and stop-over cabins, roads laid out and built, and ranger headquarters and cabins constructed. Administrative procedures were established for selling timber and for the regulation of grazing and recreational use. A fire detection and control system, well up-to-date for its time, was established. When the Rocky Mountains Forest Reserve was transferred to Alberta in 1930 the Province inherited the physical establishment and the procedure, and also absorbed much of the personnel into its public service. The Alberta Forestry Branch was formed in the Department of Lands and Mines to carry out the administration of provincial forests.

The year 1930 is significant in another way - the beginning of the great depression. The next decade marked a time of intense economic stress. Governments found it necessary to reduce expenditures drastically. Forestry, along with all other branches, suffered reductions in budget. Forest fire-fighting, always a costly undertaking, suffered proportionately. Even during the depression, and particularly as the depression subsided, use of the forest resources increased. Forest fires also increased, reaching a peak in the very serious fire season of 1936 when thousands of acres of forest burned uncontrolled in the Rocky Mountains in late summer and fall.

## 5. ESTABLISHMENT OF THE EASTERN ROCKIES FOREST CONSERVATION BOARD

The idea of establishing a joint Federal-Provincial conservation program on the eastern slopes of the Rocky Mountains was conceived in the depth of economic depression. The Government of Alberta realized that existing fire control and management were not adequate for the conditions at hand. It also realized that water was rapidly becoming one of the important products of the mountain slopes and that watersheds were in danger. Increasing use of the wood, forage and game, without corresponding increases in supervision, was taking its toll of watershed values. Added to this, in 1936 the worst fires in several decades were having an adverse effect upon the land where the river begins. However, the Provincial Government lacked the financial resources to attack the problem unaided.

In June of 1947 a Memorandum of Agreement was signed by J. Allison Glen, Minister of Mines and Resources, and N. E. Tanner, Minister of Lands and Mines, representing the Federal and Alberta governments respectively. The Board was then appointed. Offices were located in the Calgary Public Building, staff recruiting began, and the first Board meeting was held October 2, 1947. Parliament passed the Eastern Rocky Mountain Conservation Act in July of 1947, and in March of 1948 the Alberta Legislature passed a similar Act. The Board was officially constituted on April 1, 1948. The agreement could be terminated after twenty-five years upon one year's written notice by either party.

The duty of the Board was to plan, advise, direct, supervise, and carry out the following:

(a) the construction, operation and maintenance of the physical facilities of a forest protection program;

(b) the protection of the forests from fire, insects, disease and other damage;

(c) the conservation, development, maintenance and management of the forests with a view of obtaining the greatest possible

flow of water in the Saskatchewan River and its tributaries.

The Board was authorized to make plans for forest inventories, the construction of roads, buildings and facilities essential to protection and management, and for forest management programs and to supervise and ensure the execution of such plans. It also was authorized to carry out investigations and research and to make arrangements with government agencies for the undertaking of research and other inves tigati ons and for the obtaining of aerial photographs, maps and surveys.

During the first six years, the Federal Government was to provide up to $6,300,000 for capital expenditures and the expenses and salaries of the Federal members of the Board, and to share in the cost of maintenance of the area. The Provincial contribution was to carry out under direction of the Board, the prescribed work programs, along with a program of administration and maintenance which would support the plans and programs outlined and to pay expenses of the Board member or members appointed by Alberta.

Following a meeting with departmental officers of both governments and Treasury officials of the Department of Mines and Resources, the Department of Justice ruled that the Board was an independent authority established pursuant to agreement between the Dominion and Alberta governments. It had powers to establish by-laws and procedures. Banking procedures were initiated with an account opened in a Calgary bank to which funds were remitted by the Treasury Officer of the Department of Mines and Resources from funds made available under the Act, or from the Alberta Provincial Treasurer. The independent status of the Board ruled out employees coming under the provisions of the Dominion Civil Servant Superannuation Act. Employees were neither federal nor provincial civil servants.

At the outset it was intended that Canada would contribute the major share of maintenance funds but the experience was somewhat different. On the basis of an estimated $300,000.00 annual maintenance budget Alberta's share was to be $125,000.00 and Canada's $175,000.00 until such time as revenues from surface

rights on the area exceeded $125,000.00, at which time Canada's share would be reduced by the excess. For the year ending March 31, 1949, Canada contributed $116,873.00 and Alberta $131,679.00 toward a maintenance cost of $248,552.00. The following year (1949-50) Canada's share was $142,498.00 and Alberta's $171,355.00. In both years the revenue from surface rights exceeded $125,000.00 and by 1952 revenues paid almost the entire maintenance cost (Government of Canada contributed only $40,121.00 for the year 1951-52). An amendment to the Act in 1952 relieved Canada of any contribution toward annual maintenance. The first seven years ended with the capital program as initially planned virtually completed and resource management activities well under way.

## 6. BOARD ORGANIZATION

The Board was a body corporate consisting of a chairman and two members. During the capital period, when the major outlay of funds was being made by the Government of Canada, the chairman and one member were appointed by that government. The first Federal appointees were Major General Howard Kennedy, Chairman, and James M. Wardle. Heber G. Jensen was the Alberta appointee. After the capital period, the chairman and one member were to be appointed by Alberta with the third appointed by the Federal Government. The organization initially consisted of three divisions: office administration, engineering and forestry. The Engineering Division had responsibility for construction of roads, communications and fire protection and these projects absorbed most of the capital funds supplied by the Federal Government. The Forestry Division was responsible for forest protection planning (essentially fire protection), inventories and forest land management planning which included investigations and research.

The Board, in organizing its forces, set out to make use of all available government agencies. Alberta was to retain the administration of the Forest Reserves and it was not intended to duplicate the organization and facilities

available. The entire field force of the Forest Reserve, from superintendent to ranger, their assistants and fire lookout men, even though part of the Alberta Forest Service, were to serve in carrying out the Board's program. They were responsible for day-to-day administration and for the implementation of the Board's policies. A staff of trained people was hired to do the work which could not be done by arrangement with other agencies. Their main function was policy making and planning with responsibility for construction and maintenance during the capital period.

During the capital period, which extended over the first seven years, the Board's staff reached a total of 82 persons, including temporary help. After the close of the capital period the number diminished. Some were transferred to the Alberta Department of Lands and Forests along with the responsibilities which they had held with the Board.

Implementation of the policies and programs framed by the Board devolved, to a large measure, on the personnel of the Alberta Forest Service which supplied a nucleus of trained men and established procedures. Control was established through a liaison officer selected from the Alberta Forest Service. His function was to co-ordinate joint efforts. Integrating the activities of the Board organization (having policy and planning functions) with the Alberta Forest Service (having the administrative function) was a major undertaking and the problems and conflicts that might be expected in such a situation did arise. However, a satisfactory degree of co-operation was achieved.

Other federal and provincial government agencies were able to give assistance in resource management and in carrying out investigations. Among those which gave considerable help were Canadian Forestry Branch*, Water Resources Branch**, Ento-

* Now Canadian Forestry Service, Department of the Environment

** Now the Water Management Service of the Department of the Environment

mological and Pathological Section of Science Services*, National Film Board, Alberta Water Resources Branch, Alberta Lands Branch and Mines Branch. Co-operative fire fighting agreements were also reached with the National Parks Service and with British Columbia. The co-operative watershed research program brought assistance from other agencies.

The Acts and the Agreements made it clear that the broad objective was the conservation of the mountain watershed of the Saskatchewan River through good forestry practice. The prime objective was originally defined as "the greatest possible flow of water in the Saskatchewan River". Obviously, maximum flow as a single objective, without concern for floods and erosion, is not desirable and the Board chose to interpret the objective as "optimum" flow with priority given to water quality and timing. The management policy developed was based on this concept.

The land resources of the three forests constituting the conservation area were varied. There were the renewable resources of water, wood, forage, wildlife and recreational opportunity and the non-renewable resources of coal and petroleum. Each had an influence on the watershed. Obviously the traditional approach of government was no longer adequate. There was need for a fresh approach to develop a policy which would integrate the forest land uses and relate them all to the prime objective of optimum flow in the rivers.

Consideration of the close relationship between land use and watershed condition, along with recognition of the economic value of all the resources, led to the adoption of an integrated, multiple-use resource and land management concept with the triple objective of protecting forest conditions as they existed, restoration where damage had occurred and improvement of natural conditions. The renewable resources were to be managed, as far as possible, on a perpetual yield basis. Where conflicts arose between the interest of watershed management and any other

* Now Canadian Forestry Service, Department of the Environment

resources, priority was to be given to watershed values. Where conflicts arose between other resources, priority was to be determined on the basis of the greatest good to the greatest number of people, without damaging the basic water resource.

Although the Agreement implies that good forestry practices will attain the objective, this is not necessarily so. The vegetative cover most efficient for timber production does not produce the optimum flow of useable water because, under management for timber, water loss through interception and transpiration is at the maximum while desirable snow accumulation falls far short of the maximum. Usually the conditions for most efficient timber production and those for good water supply are not identical.

This degree of incompatibility between watershed management and forest management was realized in the beginning, and became more obvious as time went on. It was also known that a good forest cover on mountain watersheds had a beneficial influence upon the water yield with respect to quality and timing. It was also realized that the varied vegetative covers of the east slopes (grassy exposed hillsides and meadows, young growth pine, over-mature timber with openings, and rocky, sparsely covered alpine areas) all played a part in the water yield but how each functioned in the hydrology was not known. As a result, a cautious approach was taken. Preservation of the forest resources in their existing conditions, with restoration where damage had occurred, was given top priority. Watershed improvements were contemplated for the future.

Within the framework of the policy several programs were undertaken which fell administratively into two broad classes: (1) capital improvements, and (2) those associated with forest land management. Some programs, such as developing a fire control program, involved both capital improvement under direction of Engineering and planning under Forestry.

A brief outline of the Board's operations, with mention of some significant activity, follows. It is divided into: (1) capital period, (2) administrative

period, and (3) policy and planning period.

## 7. CAPITAL PERIOD 1947-1955

During this period, most of the Federal capital grant of $6,300,000 was spent for capital improvements in preparation for the basic task of planning multiple use of the resources of the area to preserve the watershed and ensure optimum flow. Protecting the forests from fire was given the highest priority in the spending of capital funds. The most serious problems in fire control were due to inability to transport men and equipment rapidly, and to poor communications. To overcome these problems and facilitate efficient administration and resource development, an extensive road network was constructed as the main element in fire control; better communication was achieved by expanding the radio network to replace the grounded telephone system. Planning a fire lookout network was begun in 1948. Insufficient accurate information, maps, aerial photos, climatic data, etc., about the area made intelligent planning for the use of the resources impossible, so programs of mapping and aerial photography were set up and a network of storage precipitation gauges installed in the more inaccessible areas. Meteorological stations were set up at all Ranger Stations to supply information for determining forest fire danger as well as other uses. New dwellings and service buildings, electric power and modern plumbing gave the ranger staff greatly improved living and working conditions.

It soon became evident that the six years originally set for the capital period was too short a time to make the best use of the capital funds. An extension of one year was therefore given.

Once fire protection planning and development got under way, consideration was given to resource management. Surveys and inventories provided the information required for planning of forest programs for forest land resources. While inventories of the forest land resources were being gathered, some stopgap projects were undertaken. Among these were tree planting trials on grassy hillsides and meadows.

It had been assumed that the lack of tree cover on the south and southwest slopes and valley bottoms was a result of fire and livestock grazing, but these trials and further knowledge of the local ecology showed that grasslands are part of the normal vegetative pattern of the mountains. Establishing a tree cover there meant working against nature and introducing problems difficult to solve.

Concern about the effect of livestock grazing upon forest cover and watershed values led to an early start on an inventory of the forage resources and range conditions, with the survey beginning in 1949 (see Section 9.6).

Inventories of forest and watershed soils were taken in conjunction with the range survey. No recreational resource inventory was taken but the registration of all forest visitors indicated a sharp rise in the number of campers, picnickers, fishermen and hunters entering the forest (see section 8.2).

For protection against insects and disease, an arrangement was made with the Entomology and Pathology Section of Science Service, Canada Department of Agriculture, to keep the area under surveillance and to report any imminent outbreak.

New roads gave accessibility which brought requests for commercial development, increased use of the forest resource and new interest in the extraction of gas, oil and minerals. New policies were required to meet the resulting problems.

A description of the capital programs follows.

### 7.1 Road System

The relative advantages of ground and air transportation in moving men and equipment in fire fighting were carefully weighed. The Conservation Area consists of a long narrow strip of ranges of mountains and hills with few opportunities to land fixed wing aircraft. Winds are strong and gusty, and there are treacherous down-drafts. At the time, helicopters were not capable of operating safely at prevailing altitudes. The nature of the area and the state of the arts of aerial attack on fires clearly called for a road system consisting of a trunk road from

Coleman northward with connecting roads linked to ranger stations and to the highways and major municipal roads near the forest boundary, thus establishing internal and external access. Truck trails to fire lookouts and to inaccessible areas were also in the construction plans.

The engineering division responsible for capital projects was organized under a chief engineer with graduate engineers in supervisory capacity. A small permanent supporting staff was kept and student engineers and others hired for the summer field work.

The chief engineer was not hired until February of 1948, but in January the Senior Superintendent (Liaison Officer) of the Forest Reserve was asked to draw up a road network for Board approval. As soon as weather permitted in the summer of 1948, the location and surveying of the road began and construction was started on the Jumping Pound road and the Trunk road, each under direction of a road engineer.

The trunk road was begun in the early spring of 1948 with two survey parties in the field, one working north from Coleman and one south from Kananaskis. The construction of the first six miles of road extending north from Coleman was contracted as were secondary roads through the Jumping Pound district and from the Clearwater and Red Deer ranger stations to the Reserve Boundary. Two road contracts were let in 1949; one for 40 miles north of Coleman and the other for 32 miles southward from the Kananaskis Forest Experimental Station. Location survey crews worked ahead of the contractors. Secondary road construction included rebuilding a section of the Chungo oil road north from Nordegg, the completion of the Red Deer ranger station road and its continuation west, the Highwood road and Johnson Creek road. About 35 miles of truck trail, mostly to lookouts, were also built.

The 1950 season saw the trunk road extended and gravelling contracts let for the completed parts. Some secondary road was completed and truck trails were built to Moose Mountain and Mockingbird lookout and truck trails elsewhere to

allow access.

The trunk road as finally completed is a high standard gravel road built from Coleman to Nordegg in the capital period but subsequently extended to Grande Prairie. At the end of the capital period the network included 274 miles of trunk road, 176 miles of secondary, 380 miles of truck trails, 92 miles of lookout roads and 130 miles of commercial operation roads. To build this network required the clearing of 2,200 acres of land, excavating 4,150,000 cubic yards of earth, 10 1/3 miles of culvert pipe and 65 bridges with 1 mile of bridge decking.

### 7.2 Radio

The Radio Branch of the Department of Lands and Forests, in conjunction with the Chief Forester, made a study to determine the best kind of equipment to serve the needs. Radio engineering consultants were contacted as well. As a result, a medium-high-frequency FM radio-telephone system was approved in June, 1949 and purchase of equipment authorized. Testing of sites and installation at ranger stations and lookouts proceeded as equipment became available, and the system was about complete by 1953. Some old AM sets were in use until this time and the AM transmitter in Calgary was also operated. At the early installations at ranger stations, gasoline powered generators were used. The gasoline engines were replaced by propane to give greater dependability and lower maintenance cost. Eventually, line power was brought into all stations, and in some cases to lookouts, where the distance was not too great. Where a generator or line power was not installed (at distant lookouts) batteries and converters were used. Mobile sets were placed in all service vehicles used in the field and portable sets were available for camps and similar use.

Problems arose, such as blind spots in the mountains, but excellent reception was also discovered at very unlikely but useful locations. In general, the radio system gave good intercommunication and helped greatly to modernize administration and fire protection.

Once the network was established, the responsibility for its operation and maintenance passed from the Board to the Forestry Radio Service. Then on April 1, 1962, the Alberta Government Telephones took over the operation of the Forestry Radio Service.

### 7.3 Fire Protection

The fire detection and suppression methods used on the area prior to the Board's time were of the kind found in similar areas in Canada and had served well. However, they were no longer adequate in the light of new demands upon the forest resources and more extensive activity in the area. The nine existing lookouts were considered insufficient to cover the area. A system was needed with equipment and materials to detect a fire in any part of the reserve as soon as it occurred and to move an effective suppression crew to the site by ground transportation before the fire became a conflagration. Capital funds were used to locate a comprehensive system of fire lookouts, establish adequate communication and equip and man a fire fighting organization. The fire fighting equipment left much to be desired, so new hand tools, gasoline-powered pumps, hose and trucks for rangers and suppression crews were purchased.

Continuous appraisal of existing lookouts during the capital period indicated that most were satisfactorily located. Cameron lookout on Mount Burke in the Highwood district was, however, an example of unsatisfactory location. It had a tremendous view and yet few if any fires had been detected from there. Blackrock lookout in the Ghost district was so difficult of access that it took a three-day pack trip to service it, and yet its record of detection was not good. Some other locations were discarded because a better location was found covering the same area. A view of the trunk road (under construction) was considered as paramount because of the increased travel and associated activity anticipated along its route. Important timber stands, like the one in Dutch and Racehorse basins, were given special attention and Sugarloaf lookout was selected to observe this prime

timber area as well as to overlook a section of the trunk road.

Although the final test of a lookout must be made on the ground, there was a distinct need for a rapid method of finding prospective sites from maps in the office. The Chief Forester designed a clear plastic instrument which, when applied to a reliable contour map, showed areas which were visible from the proposed lookout. The working of the instrument was based upon changing contours and the vertical angle from the proposed lookout in relation to possible obstructions. The visible areas were colored in as the observations proceeded. It was a very practical method and as accurate as the contour map used. This method was used to evaluate propsective sites and to select the lookout network and also in visibility mapping of established sites. As a final check, a complete panoramic photo was taken from each site and the coverage determined from it. On-location checks required little change in the visibility maps made in the office by the use of the instrument. Thus a network of lookouts giving reasonable coverage from the Castle River to the Red Deer was established with capital funds.

The equipment for locating fires from the lookout was considered outdated for the east slopes. A new method for locating fires from the lookout, which worked well in mountain country, was devised by the Chief Forester and his staff. It consisted of a complete set of panoramic photographs taken from the lookout and mounted in a circle on the table in such a way that, with the directional arm and known locations marked on the photos, the fire could be located as to the drainage and its relation to known landmarks. This method was developed and applied in all lookouts on the Conservation Area.

The fire protection system initiated by the Board was further developed by the forest protection branch during the Administration Period. In 1959, when Administration was transferred from the Board back to the Department in Edmonton, the fire protection program and the Forester-in-charge went along. Organization for fire suppression and prevention was not changed in fundamentals but was added to and

improved.

With the fire protection program turned over to the Alberta Forest Service there was a trend toward unifying the system throughout the Province. The innovations developed particularly for the mountain areas tended to be swallowed up by those applicable to the larger boreal forest area. The panoramic-picture method of locating fires was discontinued. The use of aircraft for fire bombing and other up-to-date methods used successfully in the north were introduced on the Area. Considerable money was spent on improving the fire control program on the Conservation Area and it may be of interest to look at the results for the period 1949 to 1972 (24 years).

There was a total of 749 fires reported or a yearly average of 31 fires. The total area burned was 9,398 acres which is less than 2/10 of 1% of the total area (5,729,920 acres). The annual average burn was only 40 acres which is an insignificant fraction of the total area. An allowable burn accepted in Alberta as a whole in that period was 1% of the total area.

The number of fires reported was fairly high in 1961, amounting to 61 and averaging 30 over the following 24 year period. However, almost all of these were suppressed while in the incipient stage and destruction by fire was low. Even in the year 1961 with 61 fires, the area burned amounted to only 233 acres. In only four years (1949, 1957, 1958 and 1967) did the burned area exceed 1,000 acres out of a total of nearly 6 million acres.

The number of fires increased as did the industrial and recreational use. The number of fires and area burned are shown by quartiles below.

Fire and Burned Area by Quartiles

| Quartile | No. of Fires | Area Burned |
|---|---|---|
| 1949 - 53 | 63 | 5,589 acres |
| 1953 - 60 | 117 | 6,843 acres |
| 1960 - 66 | 255 | 521 acres |
| 1966 - 72 | 294 | 1,852 acres |

There was no obvious correlation between number of fires and the area burned. The area burned was more likely related to fire weather but in any case it was to the credit of the protection force that the destruction by fire did not increase with the incidence of fire.

The incidence of lightning as a cause of fire in the mountains came to be realized during the period. With better detection the proportion of fires identified as caused by lightning increased appreciably until this was the greatest single cause of fire. Only when all fires caused by man's activities were bulked together did this group exceed lightning fires.

A lightning fire which occurred during the period demonstrates that, regardless of the efficiency of fire suppression programs, fire can, under certain meteorological conditions, go out of control. A lightning strike occurred on Colt Creek in plain sight of a lookout and was reported immediately. Within 10 minutes it was reported as spreading rapidly and fanned by a strong north-west wind soon became a crown fire. Although fire fighting equipment and experienced men moved toward the fire at once it was out of control before they arrived, spreading at a rate of 10 acres per minute. Action by the crew was ineffective until early evening when the wind abated and bulldozers and men could work on the fire line. Early next morning a light snow fall helped the crew control the hot spots on the fire line, but not before 4,760 acres of timber had been burned over.

### 7.4 Buildings & Equipment

Most of the buildings and much of the equipment dated to the period between 1910 and 1930. Since then money for capital improvement had been almost non-existent and even maintenance funds were very scarce. More modern living accommodations were needed and there were few trucks and no tractors. The Board replaced most of the rangers' houses with modern dwellings, and those not replaced were modernized. Other construction included bunkhouses, barns, implement sheds, shops and stop-over cabins. A Crowsnest Forest office and shops were built at Blairmore.

Fire fighting equipment, trucks and tractors, road maintenance equipment and motor vehicles were purchased. A uniform for rangers and forest officers was designed and furnished at half cost.

The old pack trail network which had been built before 1930 had not been well maintained and some of it was in poor condition or inaccessible. This network was not restored and there was a conscious move away from horses to mechanical transportation. Although all rangers maintained a string of saddle horses during the capital period, they were supplied with trucks and in some cases with small tractors which they used to service lookout towers and to get around on newly built truck trails. Subsequently trail motor bicycles were supplied to rangers and keeping horses was discouraged or prohibited by the Alberta Forest Service.

### 7.5 Summary of Capital Period

The Federal Government provided $6,300,000 for capital improvements, of which $6,278,906 was expended as follows:

| | | |
|---|---|---|
| Improvements and Works: | | |
| New Construction: | | |
| Roads and trails | $5,247,063.30 | |
| Buildings | 195,701.80 | $5,442,765.10 |
| Other Expenses: | | |
| Range and watershed survey | $ 126,038.11 | |
| Radio network | 57,072.24 | |
| Camping Grounds | 34,500.38 | |
| Stream gauging | 18,090.73 | |
| Visibility mapping | 8,139.94 | |
| Water resources survey | 6,684.90 | |
| Boundary survey | 5,078.20 | |
| Film production | 2,464.68 | |
| Stock gates and entrance gates | 2,660.98 | |
| Hay meadows | 1,700.52 | |
| Miscellaneous improvements | 4,905.40 | |
| Radio survey | 1,464.70 | |
| Forest signs | 2,436.07 | |
| Basic surveys and mapping | 1,449.20 | |
| Telephone lines | 1,164.05 | 273,850.10 |

| | | |
|---|---|---|
| Total Brought Forward: | | $5,716,615.20 |
| Movable equipment: | | |
| Tractors and heavy equipment | $ 216,841.03 | |
| Cars and trucks | 101,594.73 | |
| Radio equipment | 81,541.08 | |
| Forestry equipment | 73,351.70 | |
| Camp and miscellaneous equipment | 67,330.89 | |
| Office furniture and equipment | 2,826.68 | |
| Livestock | 80.00 | 543,566.11 |
| Loose tools and small equipment | | 18,724.79 |
| | | $6,278,906.10 |

The period of expenditure of federal capital funds by the Eastern Rockies Forest Conservation Board ended March 31, 1955. The construction program planned was virtually completed. The program supplied a system of roads and trails, a radio and communication network, modern buildings, tractors and equipment, camp grounds, a fire protection system that compared favorably with any in Canada, resource inventories, basic surveys and mapping, and improvements in basic data gathering system (meteorology and hydrology) and management plans were well under way.

Although the funding of capital improvement by the Government of Canada ended in 1955, much of the improvement program continued with monies supplied by Alberta. As examples, the Trunk Road was continued from Nordegg to Grande Prairie and the fire protection organization was greatly enhanced along the lines planned by the Board.

### 7.6 Mapping Problems

When the Board staff began work, available maps and aerial photos were inadequate to provide the necessary information. Some projects were postponed until suitable coverage of maps and aerial photos were available. A scarcity of survey lines, pins and bench marks forced the road surveyors to operate for as much as 50 miles by dead reckoning and to carry levels for 100 miles or more without a

check. Full map coverage of the area was available on only one series at a scale of 1" = 8 miles and with contours in altitude tints at 1000' intervals. These were not adequate for the purpose at hand. For instance, the heights of land which formed boundaries between forests and districts could not be located.

There were other maps of limited usefulness, but no single topographic series covered all of the Conservation Area and even patching together all the known maps, some areas remained blank. Much of the information was outdated and some contours were far from accurate. However, the work continued with what was at hand and considerable investigating was done to dig up little-known maps (such as the Bridgeland Series) which were pieced together, and new maps were drafted for unmapped sections from aerial photos.

Typical of maps prepared by Board staff was one drawn up for each ranger district for use by the field crews. Inventories were to be taken of the land resources: timber, range forage, and watershed soils. Aerial photos were used in the survey but base maps were required for tabulation and location. The best contour maps available were modified to a common scale of 1" to the mile and pieced together. There were problems in jibing the contour lines from different maps. In the case of the Ram District there was no map of any kind for one area and a map of the missing part was prepared from aerial photos by use of a Kail plotter. Flight lines of the aerial photos which were to be used in the field were plotted on the field maps. These served a very useful purpose for a decade or more before more accurate maps became available. Timber berth maps were prepared by plotting the timber information from aerial photos on available planimetric bare maps.

The Board hired Arctic Air Lines to photograph the Conservation Area. They were instructed to fly the areas where land management could be applied, that is, to give emphasis to the valleys and gentler slopes. The lines were meant to be along valleys. It was hoped to get a high quality picture of the valleys and lower slopes with less quality on the mountain tops. The result was a great disappoint-

ment. The job, flown in 1950, was of limited use. The following year the Province of Alberta photographed the province at a scale of 3333' = 1 inch. Later the area was flown and photos at a scale of 1320' = 1 inch were produced.

Aerial photos were used in forestry for recording field data, as a substitute for observation trips in the field and for other purposes. For plotting field data on maps a stereo (Kail) plotter was purchased. All the initial range management maps were produced on this machine as well as the early timber berth maps. The Kail plotter fell into disuse as more efficient equipment was installed in Edmonton.

Aerial photos were not used to any degree in road engineering until near the close of the capital period. A rough location was sketched on the photos and they were taken into the field. The road location on the ground was accomplished by the use of a compassman with a level, and a bulldozer. Much time and cost was saved thereby. As time went on new maps were produced and new photos taken by both federal and provincial agencies. The serious problems encountered in the early days through lack of cartography dwindled into insignificance.

## 8. SPECIAL PROBLEMS

### 8.1 Petroleum Recovery

Some of the earliest oil well drilling in Alberta occurred in the mountains of the Conservation Area. Following the initial oil discovery in the Waterton Lakes area two wells were drilled in the Castle River valley, one near the present ranger station (Kelley's Camp) and one at the foot of Middle Kootenay Pass. Two wells were drilled in the Livingstone valley, one on Ridge Creek and the other on Dry Creek. With the Turner Valley oil activity in the 1920's drilling extended into the Forest Reserve west of there, particularly in the Moose Mountain area.

However, in 1948 there were no producing wells in the Conservation Area and little drilling or exploration, but increased demand for natural gas was arousing renewed interest in the upper foothills and mountains where gas was more abundant

than liquid petroleum. By 1955 seismic exploration for petroleum was general in the area and several high producing gas wells were struck. Most of the gas was high in sulfur which found a ready market. The tempo of drilling and exploration increased until, by 1973, the entire area was laced with seismic lines, dotted with gas fields, crossed by pipelines and access roads. Two large sulfur and gas processing plants were in the Area and several others were adjacent to the eastern boundary.

Exploration and drilling prior to 1950 had been mainly on the plains or lower foothills in Alberta and on private land. At that time there was little need for controls on exploration activity along road right-of-way or public land in the plains. Disputes between private owners of surface rights and the holders of petroleum rights were settled under the provisions of The Right of Entry Arbitration Act. As activity moved into Crown land of the Forest Reserve new problems of conservation arose on the steep, unstable mountain terrain where watershed values ranked high. Consultation with individual companies and the Canadian Petroleum Association revealed that Company officials were willing to co-operate in keeping damage to the watershed to a minimum. It was, however, difficult to control the machine operators back in the hills and initially damage was great. Seismic outfits with bulldozers and trucks moved into forest land cutting out lines along which the seismic trucks were hauled and gouging trails up and down steep slopes and across or along streams.

The recovery of petroleum products made considerable change in the landscape of the Area. During 1970-72 more land was affected by industrial activity (mostly petroleum) than was logged over. The problems of managing the land for a sustained yield of the renewable resources, especially for recreation and water, were multiplied many fold by the activity of petroleum companies in the mountain areas.

It took some time to assess the problem, to make it known to the administrators and to obtain legislation to bring about legal controls. In the meantime,

the Board exercised as much control as possible under existing regulations. With the transfer of the administration of the Conservation Area back to the Department in Edmonton in 1960, the Board concentrated on developing improved practices in exploration and drilling, designing methods of restoring damaged watersheds, drafting regulations for legislative action, and negotiating with companies and the Canadian Petroleum Association.

By the end of the period (1973) the legislation was considerably strengthened and controls were more effective. An organization had been developed within the Department to handle the problems of surface damage by mining and petroleum extraction, which included: a Forest Land Use Branch with a section dealing with surface rights and activities, a land-use officer in each Forest, a program of reclaiming damaged land and legislation requiring preventative procedures and reclamation by operators.

### 8.2 Recreation

The Board was well aware of the recreational potential of the area and equally aware that greater leisure time and the new roads would result in a heavy influx of people if strict controls were not exercised. They believed it would be a mistake to allow great numbers of people to indulge in unrestricted activities until careful planning was done. They therefore did not encourage recreational use but permitted certain activities which could be reasonably well controlled.

Increased fire danger from campers scattered indiscriminately along the roads and elsewhere led to the building of a system of camps to concentrate camping in areas with good coverage by the fire detection system and where suppression methods could be readily applied. Shelters and masonry or metal fireplaces were built. The number of visitors increased so rapidly that camp facilities in some areas could not keep up with the demand.

With the return of full administrative responsibility to the provincial Department in 1959, a forester in charge of recreation was appointed and detailed

planning of recreation at both the forest office level and at headquarters began. The Board continued to handle policy matters and maintained a firm hand on recreation by requiring that all development, both government and commercial, be approved by the Board. Broad plans for recreation were included in the "Unit Guides" prepared by the Board staff. In conservation units were recreation was a major land-use, a land classification for recreation was made.

The increase in recreational travel in the Area, demanded facilities such as service stations, motels and ski lodges. Applications were carefully screened and numbers restricted. Service stations, three with motel and restaurant attached, two ski lodges and associated facilities were permitted. A large recreational complex designed to cater to various needs was approved but never developed. Although requests for summer cottage sites have been numerous, only one area including 70 summer homes was allowed.

The management of recreation grew from an incidental item in the early days to a major responsibility. In some districts recreation became the dominant use and was given priority. Desirability of a satisfactory basis for allocating land for recreational use led to a detailed study of the potential uses of land in the foothills and mountains by the Government of Alberta. This study took up at the point where the Conservation Unit Guides left off in the evaluation of the potential of the mountains and foothills land for recreational and other uses. The study, which made use of the Canada Land Inventory and received federal assistance, was encouraged by the Board.

## 9. INVESTIGATION & RESEARCH

Watershed management, especially in Canada, was in its infancy when the Board began. Little was known about mountain land hydrology. Methods of influencing the quantity or timing of flow had not been established or proven for the situa-

tions on the Area. Even basic hydrometric and meteorologic data were not available. Some watershed research had been carried out in other countries but the results had not been applied on the Saskatchewan River watershed.

### 9.1 Basic Information

Basic data are seldom collected until they are needed and then it is often too late. This situation was encountered as a program of watershed management was begun. An attempt in 1949 to determine the proportion of precipitation which ran off in the streams in the Kananaskis valley illustrated the inadequacy of existing information. Calgary Power hydro development gave reliable data on stream flow volumes. Precipitation had been recorded for many years at Banff and for a shorter period at the Kananaskis Forest Experimental Station. Although both stations were at elevations of about 4,800 feet the figures had been used to represent precipitation over the whole area, most of which is much higher in elevation. These records, showing about 20 inches annual precipitation, were used to estimate the total amount of water which the valley received as rain and snow. When it was found that the total runoff for the year exceeded the estimated precipitation, it was evident that considerably more water fell at the higher elevations than was recorded at the station in the lower end of the valley.

To build up a fund of information on precipitation over the Saskatchewan watershed a network of 100 storage gauges was designed. The storage gauge selected was a modification of the Sacramento gauge with an Alter shield. The tank is in the shape of a frustum of a cone, large enough to hold half the year's rain or snow plus a charge of antifreeze. They were read in the spring and in the fall so that an estimate of the winter snow and the rainfall could be made. They were located so as to sample various elevations, aspects and latitudes. In most cases they were placed in areas that were uninhabited and difficult of access.

Precipitation in the high country proved to be much greater than previously thought; as much as 60 inches annually above 8,000 feet. The amount which fell as

rain or snow was indicated by the increase in the contents of the tank in summer or winter respectively. The more reliable data made it possible to recalculate the water balance in the Kananaskis which showed that on the average about 210,000 acre feet of water run off the Kananaskis valley which is about 57% of the total annual precipitation.

The network was begun in 1954 and gave 18 years of record at time of writing. During this period measurement was made more sophisticated and the storage and analysis of data was computerized.

Stream flow records of the rivers originating on the east slopes were also sketchy, although there were some stations operated by the federal Water Resources Branch. By agreement between the Board and the Dominion Government fourteen new stream gauging stations were installed in the early 1950's on the mountain streams, with the Board purchasing the gauge and other materials and the Water Resources Branch installing and servicing them. Since that time the successor of the Water Resources Branch, the Water Survey of Canada, has increased the number of stations.

### 9.2 Watershed Research Program

The Board was aware of the magnitude of watershed management and the meagre knowledge of the subject and was able eventually to generate an awareness of the need for research to solve the problems and develop remedies. At the request of the Board the federal Forestry Branch called various research and resource management agencies together in Ottawa to assess the problem. A committee was struck to determine the need for research and as a result of their report a decision to establish a watershed research program was reached. Two alternatives were considered: establishment of a single agency with expertise of various disciplines hired, or a cooperative multi-agency set-up using personnel and establishments of various organizations already operating. The second was chosen.

A Steering Committee of high-level officials from all cooperating agencies and a Technical Coordinating Committee of people directly responsible for the work were

established in 1960.

Some thirteen agencies, both provincial and federal, joined the program and each was represented on the two committees. These committees selected objectives and worked out a research program. Each agency was responsible to finance and carry out a section of the program, either by performing research or through providing supporting services. A Research Coordinator, as the agent for the Technical Coordinating Committee, was assigned the task of ascertaining that the efforts of all were integrated and that the ideas of various agencies were brought together for consideration in program planning. This multi-agency, cooperative program was called the East Slopes (Alberta) Watershed Research Program.

To fulfill the objective of evaluation and improvement of management three major types of study were undertaken: (1) data gathering and analysis including inventories, (2) studies of the hydrologic processes involved in watershed performance and (3) treatment experiments to be carried out in experimental watersheds by manipulating the vegetative cover.

Central in the program was the setting up of three gauged basin projects: (1) in sub-alpine spruce-fir forest, (2) in lodgepole pine forest and (3) in montane aspen-grassland. None are completed but the Marmot Creek Basin project (sub-alpine, spruce-fir) is scheduled for a cutting treatment in 1973.

The program was enlarged to cover all of Alberta and the name changed to the Alberta Watershed Research Program. The Canadian Forestry Service, which had declined to organize to carry out watershed research for the Board in the 1950's, developed a prominent hydrology section. The January, 1973 issue of Forestry Report, published by the Northern Forest Research Centre in Edmonton, was devoted entirely to "Water, A Forest Product", and was written by research members of the Service who are cooperators in the Alberta Watershed Research Program.

The program originally envisaged in 1960 and put into operation in the early years was modified in some aspects. Emphasis shifted from studies of processes to

mission-oriented research. More attempts were made to learn the research needs of land managers and to satisfy these needs. To begin with, a few gauged basins occupied most of the research effort but attention shifted to studies covering broader areas. Attention turned to conceptual deterministic models to simulate trials and tests.

After a decade of research the hydrologic and other characteristics of the Saskatchewan River headwaters were much better understood. Management benefited from the work but there was still a real need for more research and also to make practical use of the knowledge gained to protect and improve the yield of water and other resources of the Conservation Area.

### 9.3 The Board's Part in Watershed Research

The Board's organization took an active part in the cooperative watershed research program by having representatives on the two committees and by carrying out services in connection with the gauged basin studies. The Board's organization also carried out considerable research and investigation on its own. The projects were mission-oriented to serve a management need. Some of these were: (1) testing erosion control on road cuts and fills, (2) erosion control on depleted range land, (3) reclamation on eroded land, restoration on seismic lines and well sites, healing gullies, healing old salt licks on cattle range, range improvement by brush clearing, re-seeding depleted cattle range, stock and game water development, reforestation, determining condition and trend of cattle range. With very few exceptions these studies were carried out to serve a specific problem at hand and the results were applied by the Board staff or the Department. As a result of the efforts of the Board and the support given to cooperative watershed research programs the fund of information basic to watershed management and the art of managing watersheds have been enhanced.

## 9.4 Forest Management

At the time the Board began operation, the Alberta Forest Service contained a corps of people with training in forest management. Therefore, the Board played a less dominant role in the timber management program which has evolved.

A forest inventory was started by the Board but due to lack of adequate base maps and aerial photos the forest type mapping was postponed. A new inventory was completed by a newly formed Forest Survey section of the Alberta Forest Service and this superseded the Board's inventory.

During the Administrative Period, the Board handled the timber administrations and introduced some innovations such as the regeneration fund and encouraged the use of operational plans by operators. After the administration returned to the Alberta Forest Service in 1960, the Forest Management Section proceeded to build a well rounded timber program on the basis of perpetual yield. The area was divided into management units with allowable annual cuts calculated for the units and quotas assigned to the operators. As a result the Board did not undertake any specific programs in timber management and limited their activity to policy, broad program planning and field checking to test application and results of the policy. At the close of the period the Board had confidence in the Timber Management Branch and its program.

## 9.5 Reforestation

Traditionally, no forest conservation program is complete without a program of reforestation. Therefore, the Board gave consideration to reforestation at the outset, even before there was opportunity to explore the needs. To one not well acquainted with the east slopes of the Rocky Mountains, the open grass-covered hillsides and river bottoms suggested destruction of forest cover and offered an opportunity for reforestation. One of the very first projects begun was an attempt to establish trees on the grassland. In the spring of 1948, nine plots were selected ranging from grassy benches along rivers to steep grassy mountain slopes.

Seeds and nursery stock of lodgepole pine, white spruce and some Sitka spruce were planted on these. All plots were enclosed by fences which kept cattle out. Deer and elk jumped over, or crawled through, the fences.

The establishment of forest cover was virtually nil on the dry benches and the very high exposed hillsides, with only the occasional tree becoming established at intermediate elevation. It was soon realized that most of the grasslands were a natural part of the plant community and establishing forest cover would be very difficult (in some situations virtually impossible) and the resulting cover unstable. Furthermore, it was soon evident that the major objective of watershed improvement would not be advanced by replacing grass by tree cover. The stable grasslands were realized to be an integral part of the watersheds, yielding more water of a reasonably high quality than they would if transformed to forest.

The program was revised in 1949 to concentrate on establishing tree cover where it did not regenerate naturally and to find the best species. The status of natural regeneration was observed, plots were established and considerable broadcast seeding was done over the next few years.

Observations indicated that burned over areas regenerated very well. In fact, the stands of lodgepole pine which appeared almost everywhere after fire were overstocked and often stagnated because of the density. White spruce was often very sparse in the post-fire stand and the re-establishment of the climax spruce forest came only after the pine stand became decadent. In some areas where pure stands of Douglas fir were dominant, fire after cutting resulted in little or no regeneration. In some cases other tree species came in but in other cases, grass established itself between the charred stumps. Clear cutting of both pine and spruce often resulted in poor regeneration.

An interesting trial, the planting of Ponderosa pine on the open flats of the Oldman River near the Gap ranger station, was undertaken in 1950. This species is not indigenous to the area but a few trees do exist south of there in the Castle

district. The plantation survived the first summer very well. The young trees were eaten down in the first winter by deer and/or elk but came back in the succeeding summer, only to be cropped off by wild ungulates each winter until they finally died. No doubt this species could be established in the lower valleys of the Crowsnest forest if protected from deer and elk.

During the 1950's the Federal Forestry Service carried out some surveys and research on regeneration of spruce in the Crowsnest forest. These led to an understanding of the problem of regeneration on cut-over land. During this same period some Scout troops became interested in forestry and as a project they planted seedlings under the direction of staff of either the Alberta Forest Service of the Board.

In general, neither planting nor seeding were highly successful. It was found that seeds (spruce and pine), whether a natural crop or spread by man, did not establish well unless some soil treatment was applied and protection from seed-eating rodents and birds given. Machine scarifying of the soil was found to be useful. Planting was highly successful only when great care was taken, which required much time and labor. New techniques for planting such as containers of various kinds were tried with some promising results in the 1960's. White spruce and lodgepole pine were most successful generally, Douglas fir promised to be more successful in certain areas.

Regeneration on cut-over land was closely related to methods of logging and could be greatly improved by scarification, burning of pine slash and other methods. For this reason the Board introduced a clause into the timber sale agreement in 1958 requiring the operator to obtain natural regeneration or to obtain an acceptable stand by artificial means. The companies were required to deposit with the Department an amount of $1.00 per thousand board feet of lumber harvested and sold. This was retained as a deposit until such time as satisfactory regeneration occurred on the cut-over land. If this was not attained in 5 years, either by

natural or artificial means, the money was to be used by the Department to plant or seed the area. Some adjustments were made such as one in which companies were offered $10.00 per acre out of the regeneration fund for scarifying cut-over land in a manner approved by the Forest Superintendent. If regeneration was obtained, any further money to the credit of such operators in the fund was to be returned. In 1959, when administration of the forest reserve was turned back to the Department, this program was discontinued. However, a basically similar program was later established by the Department.

With the end of the Administrative period (1959) any planting trials or general reforestation programs were discontinued by the Board and left to the Alberta Forest Service. It had become known that plant cover of some kind, suitable for watershed protection would regenerate in most cases. Planting generally was not necessary for watershed protection but useful to sustained timber production. Seeding of grass and legumes after a destructive fire, particularly where track tractors had been used in firefighting, was much more effective in watershed conservation than tree planting. By the end of the period, methods of establishing the desired cover, whether it be grass for quick stabilization of watershed or trees for long-term timber production, were developed for the area and in use by the Alberta Forest Service.

### 9.6 Range Management

In 1948, about 25,000 head of cattle, 2,000 sheep and some domestic horses grazed the forest reserve in summer, under permits. There was also a population of unknown size of wild horses living within the area. A wild ungulate population of deer, elk, moose, mountain goats, bighorn sheep and caribou, also of unknown magnitude, constituted a valuable resource. All these depended upon the forage resource which had been given little attention in the past. Although the early regulations set up in 1910 by the Department of the Interior and administered by the Dominion Forestry Service (subsequently by the Alberta Forest Service) recognized the im-

portance of the resource, in practice greater attention was given to fire protection and the sale of timber. Grazing of the forest was justified by some as a means of reducing fire danger by removing ground fuel, as indicated in annual reports of the old Department of the Interior 1912-1915. In certain districts the administration, with this purpose in mind, had issued permits for more cattle than the range could maintain. This was contrary to the wishes of well informed stockmen. The policy resulted in overgrazing in some areas with depletion of the range. Incipient erosion such as could have been seen in the Livingstone valley, was evident before 1948 on some of the range. In some cases a grazing unit containing little or no timber had been let out as a grazing lease and placed under the administration of the Lands Branch. When the Board began operations it found it necessary to have such leases discontinued so as to apply protective range management under integrated land-use.

However, it should not be inferred that no attention was given to grazing. Some good work had been done by the Alberta Forest Service and the Canadian Forest Service before them. During Dominion days a range inventory had been carried out on the Crowsnest and a small part of the Bow River forests by a man hired from the U.S. Forest Service. Carrying capacities had been calculated and range management plans drawn up for some units. This work was done hurriedly and estimates of carrying capacity were generally too high, as shown by subsequent results. Little attention was being paid to the sketchy grazing plans when the Board began operation even though some forest rangers showed considerable aptitude in range conservation. The Board arranged with range specialists from the Dominion Experimental Farms Service to look over the area and report. The report indicated that damage from grazing to the forage resource and to watershed was evident, but limited in extent. They recommended the hiring of a man trained in range management. Subsequently, the Board hired a Canadian forester who had left Alberta to teach at a U.S. university because of the lack of opportunities for men trained in this field.

A range resource inventory was the initial project. Crews of students were hired and trained and the work began in May, 1949 and continued each summer. During the winter season range management plans were written for the areas surveyed. The plans included stocking rate, distribution of animals, salting plans, rider help, fencing if needed and some other requirements. A system of inspection and supervision was also established to coordinate with the plans. Fenced enclosures and permanent transects were set up to assist field men in judging range condition and trend. The transects, both inside and outside the enclosures, were read at intervals of years. The results indicated what was occurring to plant succession and soil, and gave a measure of current productivity of forage as well as the watershed condition.

The inventory indicated that grazing damage to watersheds was limited in extent and not serious except in a few localities. Regeneration of forest cover had not been limited by domestic livestock and only slightly by deer and elk. It appeared that most of the existing damage could be corrected and further damage avoided by improved range management.

The Board directed and supervised the administration and management of grazing in the early years. At the same time they initiated and conducted a training program for rangers and other forest officers. As rangers and administrators became more knowledgeable of range practices the work of supervision shifted from the Board to the Alberta Forest Service. The program, including the Forester in charge, was transferred to the Alberta Forest Service in 1960 and the Board's responsibility became one of checking condition.

The staff handling range management in the Alberta Forest Service was increased and at the close of the Board's tenure three trained rangemen, with other assistants, managed the resource and supervised the field staff.

Poor condition on rangeland was more a result of poor grazing practices than too many cattle. In some cases a large elk population had built up during the

1930-50 decades. Some reduction in cattle permits was made and the opening of grazing was changed to a later date (May to June). This, in effect, reduced the grazing even where the number of animals remained the same. Where cattle were grazing in summer on prime winter range for wild ungulates steps were taken to avoid this. In general, the problem of range depletion was overcome by improved practices.

A great change occurred in the management of the forage resource on the Area, and by 1973 the system of management applied was among the most effective on any public mountain land in Canada.

### 9.7 Watershed Management

In the first years of the Board there was no program specified as watershed management. As the principle of multiple-use management became adopted with water in the position of greatest importance, all management was expected to protect watershed values. For example, the initial range survey was called a range-watershed survey and the watershed condition was recorded for all grazing land inventories. The range plans were aimed at protecting the watershed, and carrying capacities were set so that the watershed was protected. Range practices were not only aimed at a sustained yield of forage but to avoid erosion and create a plant and soil mantle conducive to optimum water yielding conditions.

Because of a lack of knowledge of the relationship of the various elements of a watershed on forest land and techniques of improving water yields, and also in the absence of high demand for water, no attempt was made to harvest timber so as to increase the yield or change the time of peak flow at the outset. Steps were taken to assess damage caused by logging, to avoid erosion and siltation, and to restore damaged areas. The basic aim was to keep the productive timber land growing a new crop of timber which would be of value at some future date when the needs may demand harvesting in a way to produce more water, or to regulate the flow.

As time went on and more understanding of the water resource and appreciation

of its value was attained a program evolved. The first step was to gather information, to inventory the water resource and the land which produced it. The range-watershed survey led to a watershed-soil survey. The need for information on the water source and the yield led to the establishment of a precipitation network and more stream gauging stations. Eventually a survey of watershed damage was conducted.

With the knowledge of the watershed gained over the years, steps were taken to plan the use of the watersheds with the water resource in mind. By the middle 1950's both the Board and the Alberta Forest Service were aware of the need for planning forest land use. The Department had divided the area into management units for timber management and the Board was establishing conservation units for planning purposes. The two were coordinated for the Conservation Area and the Board proceeded to put together conservation guides for the units. They were called Conservation Unit Guides and acted as a skeleton for planning, with emphasis upon water. Prominent in the guide were a hydrologic analysis of the unit and a land use classification with watershed use in mind.

Watershed management became the major function of the Board, the staff carrying out the broad planning, supervising, checking of results, and coordinating other planning with watershed protection and improvements.

Study of the damaged areas led to the development of procedures of restoring the watershed condition. The first project of this kind tested and demonstrated ways of stopping and healing erosion on grazing land in 1950. Others included healing gullies, stabilizing cuts and fills on roads, vegetating and stabilizing seismic lines, pipe lines and oilwell sites, establishing settling ponds for run-off from coal mine areas, and contour trenching.

By the end of the Board's tenure (1973) knowledge was at hand to make it possible to increase the flow of water in streams through the removal of forest cover. However, this was not attempted outside certain experimental basins for two reasons.

There was not a general demand for more water in the Saskatchewan River. Regulation of the flow for flood control and to supply water in the low-flow season was more important, and large scale removal of forest might contribute to floods and seasonal scarcity. Methods of trapping snow by selected patterns of logging and by structures on high plateaus were devised but no practical application was made.

It might be said that 25 years is a short period to develop a new science in forest land management, and watershed management was still in its infancy in 1973.

### 9.8 Coal Mining

Underground mining was carried on in the mountains and foothills before the establishment of the forest reserve and during World War II strip mining was undertaken. However, the fortunes of the mining companies varied with the state of the coal industry and by 1954 all but Coleman Collieries, in the Crowsnest Pass, and Canmore Mines, had ceased operation. In the late 1960's the potential market in Japan for coking coal of the kind found throughout the conservation area was realized with consequent exploration and development from the Crowsnest to the Athabasca River.

Concern about the effects of coal mining upon the watershed and other resources led to discussions with government officials which in 1948 resulted in a clause in the mineral surface lease requiring the lessee to abide by regulation and instruction laid down by the Board concerning surface disturbance. The Board did not exercise the powers granted in this clause and after a few years it was deleted. The Board sought a deposit by mine operators to insure clean up and restoration but this was not granted. In 1950, the Department of Lands and Forests and the Board each made a study of the effects of coal mining upon the land resources of the forest. Their conclusions, which were generally similar, sharply focused on the potential danger to the environment.

Significant to the conservation of the forest land resources is The Right of Entry Arbitration Act. This Act assumes the right of a holder of a mineral lease

to enter upon land to drill or mine for the minerals. The Arbitration Board arbitrates the compensation to the land owner for the losses to him through the mining or drilling. In the case of the Conservation Area the Crown is the owner. It was the Board's view in 1948 that there was nothing prejudicial to the Board's program in The Right of Entry Arbitration Act. However, in later years problems arose, typified in the Coleman Collieries' mining on Racehorse Creek. The Company, operating under an old lease, with problems of erosion, coal spillage and serious stream sedimentation occurring, applied for a new surface lease to extend its operations over the divide into Vicary Creek drainage. The Board and the Alberta Forest Service anticipated problems and jointly drew up a surface lease agreement containing some regulations which would avoid damage or require restoration where damage occurred. Among the requirements was a security deposit against damage to the watershed. However, the Company, instead of agreeing to the lease, went to the Right of Entry Arbitration Board which gave the Company the right to enter upon the lands without accepting the terms of agreement drawn up by the Board and the Department.

A long series of confrontations occurred between the Board and the various coal companies operating on the Conservation Area. Although some of the strip operations created no serious problems there were places where the watershed and other resources were damaged. Typical of this was the stripping operations on Tent Mountain along the continental divide. Here the operators in the beginning showed little or no concern for conservation. Wastes, including slack coal, were pushed over the side of the pit forming an unstable fill slope. Water from spring melt and summer storms washed over and through this material carrying streams of thick mud and slack coal into the creek and subsequently into Crowsnest lake. Coal, blowing and spilling from the trucks, also washed into the streams. Water ran down the road ditches for long distances without diversion and eroded gullies carrying the sediment into the watercourses. Eventually, efforts on the part of

the Board and the Alberta Forest Service brought about improvements of methods by the companies. Silting basins were built below the operation, but they were only partly effective. Some effort was made to control drainage from above and on the workings, and along the road. In general, the coal companies carried out the recommended conservation methods begrudgingly and sometimes corrective procedures were ineffective because of the slack way in which they were done.

The coal from the Vicary Creek mine (underground) was found to be suitable for coking. During contract negotiations it was necessary to take out trial samples. The industry was in a depressed state and this company was by no means affluent. The uncertainty of the contract and the prospect of reviving coal mining in a depressed area were used as a lever to obtain permission to operate without applying conservation methods. Then when production for export began it was very difficult to get action on restoring the damage done earlier and avoiding further damage. Under pressure by the Board and the Alberta Forest Service the company has, bit by bit, done considerable restoration and taken some corrective measures to protect the environment.

Following the initial export of coal to Japan, interest in the vast coal reserves of the area became keen. Similar coal to that sold to Japan from Vicary Creek north of Coleman was known to exist all along the eastern slope of the Rockies in Alberta. By 1970, exploration was feverish to locate suitable deposits and obtain contracts with Japanese manufacturers. Many newcomers entered the coal business, particularly Canadian Pacific Oil and Gas and Scurry Rainbow Oil. Extensive exploration in the Red Deer basin by Canadian Pacific Gas and Oil was undertaken with Japanese interests in 1967-68. Their early explorations had little concern for conservation and the Board and the Alberta Forest Service had to move in and bring pressure to bear upon the companies. The operators responded, however, and applied the precautionary and restorative practices recommended. In the years that followed and up to 1972 all the major coal prospects from

Waterton Lakes Park to the northern limit of the Area were explored by as many as six companies. Generally, the companies avoided unnecessary damage and spent money in restoration. However, some damage to the watershed was unavoidable in a program of this kind. Building of roads and uncovering of coal seams up the sides and on the very peaks of mountains cannot be accomplished without changing the face of the landscape. Erosion was avoided or checked, scars were reseeded where sufficient soil existed but the roads remained as blemishes to the aesthetics of the landscapes.

In retrospect, the efforts of the Board to avoid damage to the watershed and land resources were only partly successful. Many of the coal leases superseded the Board and did not have the clause in their lease agreements requiring them to abide by the Board's directions. This was so for the Vicary Creek mine and others in the Crowsnest Pass. The Right of Entry Arbitration Act made it difficult to deal firmly with the companies in negotiating a surface lease agreement. In fact, throughout the Board's time it was evident that the procedures of the Department of Mines and Minerals, according to their various Acts, made the Board unable to enforce environmental protection in mining situations. To illustrate: a company applying for mineral rights might be granted a mineral lease. Once the mineral rights were granted, right of entry was automatic and only compensation to the landowner could be arbitrated. Once entry was granted, the Department of Lands and Forests could do little but grant a surface lease on Crown land, without the power to apply conditions which the mining company considered as prohibitive. Furthermore, no matter how valuable the land resources destroyed by mining, there was no machinery to evaluate the losses in relation to the gains, or to reach a decision as to whether mining should be done or not at that site. It was evident to the Board that there were locations where mining should have been prohibited but in each case the existing procedure had gone into gear through the steps of issuing mineral rights and there was no way which the Board might have halted the

process.

In the 1960's the Board was considered to be very tough and very demanding in dealing with coal companies. In the 1970's, with the rise of the environmental cult, the Board was severely criticized for being too slack. Oftentimes the sector of the public working for environmental protection expressed extreme views with little concern for the economic welfare of the Province. However, they brought to the attention of the public and the Government the need for better control over mining activities in the mountains where the recreational and watershed values are high. As the Board's tenure ended, new legislation was passed to give greater control over watershed and environmental damage.

The fact is, however, that there is a vast coal resource on the east slopes of the Rockies and the need for energy will demand its utilization. It cannot be mined without affecting the environment. The experience and investigation of the Board indicated that most of the coal can be extracted without seriously interfering with the renewable resources and reclamation of land can be accomplished in most cases. The Board concluded that only in some locations should coal mining be prohibited.

### 9.9 Reservoir Survey

Since engineers were in the majority on both the Board membership and staff in the early years, it would have been unusual if structures for impounding or diverting water had not been part of the water conservation program. This aspect was first discussed at a Board meeting on December 7, 1949. It was realized that the best natural sites for large reservoirs were outside the Area but that there were locations within the mountains where small bodies of water could be held. A decision to investigate the possibility of such was reached. The purpose of the proposed reservoirs was threefold: (1) stream flow regulations, (2) water supply for fire-fighting, (3) improvement of fish production and recreation.

The reconnaissance part of the project was assigned jointly to Engineering

and Forestry. It began in August, 1950 with a map and aerial photo study to locate likely areas; with such areas inspected, and in some cases surveyed.

The first one selected was on O'Hagen Creek, a tributary of the Carbondale river. A survey was conducted and a plan drawn up for two reservoirs, one upstream from the other. On a cost/benefit basis the project was abandoned. Its capacity was low for a given dam height (100 acre feet with 15' dam). The same situation existed in other drainages looked at in the same locality and all were abandoned.

In the early part of 1950 it was decided to extend the survey throughout the area. Forestry pointed out that there were some natural reservoir locations where small potholes might be developed and places where water might be spread on coarse permeable fluvial or tattus deposits. An engineer was assigned to the project in the spring of 1951 and spent that summer season on the work.

In the drainages of the Castle, Oldman, Highwood, Bow and Red Deer rivers over 25 sites were examined but only a few warranted further consideration. These included several small headwater lakes in glacial cirques, on saddles between drainages, natural reservoirs along small stream valleys with flat gradients, and in places where water could be diverted from streams and spread on porous river benches. Three dam sites along a small intermittent stream leading into the Panther river, the lowest at the outlet of Kline Lake, were recommended as a pilot project.

Most of the sites had a high cost of construction in relation to capacity and a predicted short life because of heavy sediment loads in the frequent floods. Maintenance and the problem of releasing water from several distantly separated dams made the cost high for a relatively low regulatory benefit. The decision was to abandon the program. No doubt the depletion of capital funds with rising costs for the planned road system had an influence on the decision.

It is of interest to note that a dam, as proposed in the pilot project, was

constructed at the outlet of Kline Lake, by the Province in 1963 for fish production and recreational purposes.

### 9.10 Glacier Studies

The influence of glaciers at the Saskatchewan River headwaters upon streamflow was recognized at an early date and steps were taken to get observation and study conducted on the glaciers. In May, 1949 the Board authorized the spending of $1,000 for flow measurements from the glaciers on the North Saskatchewan River watershed. The federal Water Resources Branch agreed to carry out the work, and expanded its glacial studies. Information from the study was made available to the Board.

No doubt glaciers influence the flow in certain rivers on the east slopes but there is little that can be done to change it. The major stream flow is a result of annual precipitation and the pattern of flow, a result of the nature of the snowmelt and the pattern of summer storms. Glaciers do affect the flow of the Bow and North Saskatchewan rivers and an understanding of the ablation or build-up of glaciers was used in management planning along these rivers.

## 10. PERSONNEL

Thus far this history has dealt with events and accomplishments and mentions only a few of the people involved. To leave it that way would be to ignore the fact that history is made by people; and certainly, much of the personalities of the men who served on the Board and were employed by it went into the programs and accomplishments. For this reason some mention is made of persons who had considerable to do with the work.

## Board Chairman

| | | |
|---|---|---|
| Howard Kennedy | - | 1947 - 1959 |
| H. G. Jensen | - | 1959 - 1959 |
| J. R. H. Hall | - | 1960 - 1973 |

## Federal Board Members

| | | |
|---|---|---|
| Howard Kennedy | - | 1947 - 1959 |
| J. M. Wardle | - | 1947 - 1951 |
| G. Tunstell | - | 1951 - 1955 |
| G. Tunstell | - | 1959 - 1964 |
| J. D. B. Harrison | - | 1965 - 1971 |
| H. W. Beall | - | 1971 - 1973 |

## Provincial Board Members

| | | |
|---|---|---|
| H. G. Jensen | - | 1947 - 1957 |
| A. T. Baker | - | 1955 - 1973 |
| Ivan Casey | - | 1957 - 1957 |
| H. G. Jensen | - | 1957 - 1959 |
| J. R. H. Hall | - | 1960 - 1973 |

## Administrative Officer

| | | |
|---|---|---|
| G. Tunstell | - | 1955 - 1956 |
| S. R. Hughes | - | 1956 - 1959 |

## Secretary

| | | |
|---|---|---|
| J. D. Middlemass | - | 1947 - 1953 |
| J. M. Marshall | - | 1953 - 1968 |
| J. P. Hourigan | - | 1968 - 1973 |

## Chief Forester

| | | |
|---|---|---|
| E. S. Davison | - | 1947 - 1948 |
| E. S. Fellows | - | 1948 - 1955 |
| W. R. Hanson | - | 1955 - 1973 |

## Chief Engineer

| | | |
|---|---|---|
| G. M. Walker | - | 1948 - 1949 |
| C. R. Cornish | - | 1949 - 1954 |
| B. Van Hees | - | 1954 - 1955 |

## Liaison Officer and Senior Superintendent

| | | |
|---|---|---|
| J. P. Alexander | - | 1949 - 1953 |
| L. R. West | - | 1953 - 1953 |

## 11. THE ADMINISTRATION PERIOD 1955-1959

As the capital period ended and the administration period started considerable change had taken place. Alberta carried virtually full financial responsibility for the programs worked out by the Board. Of the three Board members, two were appointed by Alberta and the selection of the Chairman also became Alberta's right as provided in the 1952 amendment to the Act. However, at the request of the Board and with approval of the Alberta Government, Major General Howard Kennedy, the member appointed by the federal government, continued as Chairman.

The coordination of the administrative function of the Alberta Forest Service and the policy-setting and programming of the Board had not been completely accomplished by 1955. Causes were both personal and inherent in the system. The Alberta Forest Service personnel, some of whom had been instrumental in administering the area from the time it was first established as a forest reserve under the Dominion Government, were apprehensive about having new people brought in to set policy and outline programs for them. There was often a tendency for the Board to carry the policy and programming function down to details of administration which were the prerogative of the Alberta Forest Service, and for the Alberta Forest Service to do planning without regard for policy established by the Board. A position of "Senior Superintendent" had been set up in 1949 to coordinate the administration of the three forests and to act as liaison officer between the Department and the Board. This, however, had not accomplished its purpose, and the office of the Senior Superintendent of the Rocky Mountains Forest Reserve and liaison officer were amalgamated and placed under the direction of a newly appointed Board officer - the "Administrative Officer". In effect, the Board took over the administration of the Rocky Mountains Forest Reserve from the Alberta Forest Service.

The Board staff was modified to fit in with a change of emphasis from capital improvement (especially road building) to management planning and administration.

For example, the position of Chief Engineer was replaced by a Forest Engineer who was responsible for fire suppression and maintenance of physical improvements. The Chief Forester and his staff not only assisted the Board in policy making but did considerable planning of programs and saw to their execution by the forest office personnel.

The period was characterized by an expansion of the use and development of the land resources. The new road system had much to do with this, making areas accessible which had hitherto been inaccessible. Utilization of the lumber resource increased, especially northward. Recreational use and demand for commercial facilities for recreation grew greatly. Geophysical exploration for gas and oil spread rapidly. Subsequently drilling and commercial production got underway.

The fire control program planned in the early years was rounded out and improved. The fire prevention and suppression program, with its transportation system, lookouts, radio system and increased personnel, became one to compare favorably with any of similar size in Canada. A fire protection plan evolved and was put into action.

Studies of soils, meteorology, hydrology and vegetation continued with a valuable accumulation of basic data.

The Board staff was kept to a minimum and with administrative duties added to those already carried, the work load became arduous. The day-to-day administrative tasks were urgent and when necessary to neglect jobs, planning or investigation were left undone. The work of policy making and program planning suffered. However, administration was set up to follow Board policy and many programs which the Board initiated were put into action.

## 12. POLICY SETTING AND SUPERVISION PERIOD 1960-1973

In 1958 the Province notified the Board that it would re-assume its responsi-

bility for administration of the Rocky Mountains Forest Reserve, to be effective April 1, 1959. The transfer was not completed until 1960. When this occurred it left the Board and its staff free to concentrate on its major functions of setting policy, outlining programs and supervision.

Not only the administration of the three forests, but also some of the programs which the Board had initiated and was operating, were transferred to the Department in Edmonton at that time. Among these programs were range-management, fire protection and Trunk Road construction and maintenance. Only the newly developed watershed management program was kept directly under Board control.

The Administrative Officer, the Foresters in charge of fire protection, timber management, and range management, a photogrammetry technician and three of the office staff were transferred to the Alberta Forest Service.

In 1960 a reorganization of Board staff became necessary and two foresters with training in watershed management and one technician were hired. The Board's diminished staff was restructured into a small but well informed group supporting policy setting, planning watershed management and assisting in the cooperative watershed research program. One forester was assigned to the management of the watershed lands and the other to research. The forestry staff functioned as a team under the leadership of the Chief Forester, particularly in support of policy setting and programming. The staff of the Alberta Forest Service, and particularly those of the Conservation Area, gave assistance to the Board staff as needed to fulfill their functions.

The use of the resources of the Area increased greatly during the period. Petroleum exploration and extraction became the largest commercial use. Wood production declined in the southern part and grazing usage remained about the same. Recreational use increased greatly and some commercial development was permitted. Coal exploration revived and both underground and open pit mining became imminent. The new land uses on top of the regular ones, especially exploration

of the fossil fuels, were hazardous to the watershed values. Damage to watersheds increased and new administrative methods and controls became necessary.

During the early part of this period of changing conditions the Board reviewed its policy which had evolved as need arose. A policy manual was written dealing with management of all renewable resources. In consultation with the Province it was agreed that the Board would prepare "Conservation Unit Guides" for watershed management planning of each management unit. These include a watershed resource inventory, a hydrologic analysis, and standards to be reached. This became a major project of Board staff, with the last guide completed in 1971.

Besides the work associated with policy setting and planning, surveillance of conditions in the Area was maintained and management advice was given to the Alberta Forest Service. Some practical methods of restoring good conditions on damaged seismic lines were developed and demonstrated to Alberta Forest Service personnel and oil companies. Assistance was also given in drafting regulations for the control of damage by geophysical exploration and development.

As various programs, such as range management, were turned over to the Alberta Forest Service, watershed management became the major program of the Board and continued so until the Department of Lands and Forests set up a watershed management section. In 1968, the Board forester in charge of watershed management was transferred to the Department to head up the section. This was an important milestone. The assignment given to the Board was fundamentally to manage the upper watersheds of the Saskatchewan River. With the adoption of an integrated multiple-use concept of managing the mountain lands all programs were related to watershed management. Because of the dominance of watershed values in the Board's program, and since the ultimate objective was the conservation of the East Slopes by the Alberta Department of Lands and Forests, the assumption of responsibility for watershed management by the Department marked an important accomplishment.

## 13. CONCLUSION

Co-operation between governments, industry, and even between agencies within a government is not easy but can be and has been attained. Probably the most important element was the will to achieve the mutual benefits of conservation. Dedicated people with worthwhile objectives promote success. The financial support of the Federal Government during the early years of the Board's activity provided improved physical facilities essential to future progress. Policies developed by the Board and put into practice by the Alberta Forest Service have done much to ensure the security of the headwaters of the Saskatchewan River. There has been a valuable exchange of programs, notably in the adaptation of the forest management techniques developed by the Alberta Forest Service to the Conservation Area and acceptance by the Alberta Forest Service of those principles of watershed management developed initially by the Board.

It is significant that conditions generally were not serious when the program began. Severe deterioration had not taken place in the mountain environment but it had begun. Rapid development of the resource was imminent and there is little doubt that serious deterioration in the new environment and damage to the basic land resources would have occurred without wise policy and controls. Therefore, the obvious benefit is that action was taken early enough to avoid destruction. Hence, the old adage "an ounce of prevention is worth a pound of cure" has applied in this case. The problems of conserving a watershed were recognized and action taken before great damage had occurred. This not only made the solution easier but saved much in cost while retaining some values that, once destroyed, could not have been repaired.

Perhaps the most valuable contribution the Board has been able to make lies in the development of a comprehensive philosophy of integrated resource management as applied to watershed conservation. There can be little doubt that conditions on the East Slopes today reflect beneficial results from a continuously

developing program of multiple-use resource management. Of all changes resulting from Board activities none is more marked than the change from a provincial program which consisted mainly of policing the area to one of multiple-resource management. Capability of the Province to manage the Area for multiple purposes has been enhanced and developed, particularly with reference to water. A small provincial staff with one professional forester to manage the Area has increased several times in size with well qualified professional foresters and forest technicians filling all key positions. Sections for managing land uses other than for wood production have been added and developed in proficiency. Integrated land-use planning, with emphasis upon water, has become an important function of the Alberta Forest Service.

The forest fire control record for the past two decades is an enviable one in reducing loss of growing stock. With a preponderance of young forest, growth has been rapid and the total wood volume has increased. The program of management of the timber has produced a reasonably constant revenue while concurrently protecting the watershed.

Companies engaged in mining and petroleum extraction have come to realize that conservation is in their own best interests and, under the pressure of stricter regulations, have largely eliminated the harmful practices of their earlier operations. The scars of carelessness or indifference are healing. Strict regulation has brought the grazing requirements of ungulates and the allowable domestic livestock in good balance and there is evidence that the population of deer, elk and moose has increased. The cautious approach to recreational use prevented a marked adverse effect on the watershed or other resources even though the facilities provided have never quite kept up to the demand.

The quality of water has been improved but there has been little change in total water yield or regime of flow. However, serious damage to the watershed would have occurred had the previous use of land continued without planning and

control. Erosion is at an acceptable level and mineral pollution is minimal.

The word "ecology", now on everyone's tongue, is derived from the Greek "oikos" or the house. So also is the root word of "economy". In both cases the root indicates that "environment" in which organisms or business affairs exist and thrive. The experience of this program shows that neither the recent radical view of leaving the environment untouched nor the view that the greatest immediate monetary gain will result in the greatest good for the greatest number is tenable. Both ecology and economics need to be brought together into "one house". The Board's experience definitely demonstrated that in dealing with the complex mountain environment it is folly to consider the forest as trees only and that dealing with mining, grazing, recreation or other use independently is not in the best interests of the nation. Integrated land use management under a central controlling authority is necessary and can be applied in a practical way on mountain watersheds to conserve both tangible and intangible values.

The Board was given a high degree of autonomy and independence which permitted undivided concentration on the problems of conserving the watershed. It enjoyed the confidence and support of the two governments and was able, probably to a much greater degree than government, to resist the political pressure for commercial and recreational development before the controls necessary to maintain the watershed could be established. Its experience demonstrates that in situations requiring the acquisition of specialized knowledge and the imposition of controls, which may initially be unpopular, a regulatory authority can usefully be imposed between the public and its government.